REPORT BY THE TASK TEAM ON ASAP

(report provided by Rudolf Krockauer, Chairperson of the ASAP Task Team)

1. Introduction

The number of ships, which routinely provide upper air soundings on the GTS throughout the year, is about 20 worldwide. Occasionally there are some research vessels, which perform soundings during certain research campaigns. However, these activities are usually limited to some weeks.

There are only two significant ASAP programmes: The European programme E-ASAP with 12-16 ships in 2007-2008 and the Japanese programme with 5 ships. The Japanese ASAP stations are operated on research vessels. E-ASAP is the only programme worldwide which is based on a fleet of commercial vessels (except 2 ships). Therefore the report of the ASAP Task Team is focused on E-ASAP.

2. Basics

Following key differences to land based radiosonde stations shall be pointed out:

- Almost all ASAP, systems in the E-ASAP fleet are installed on commercial container vessels. The ships sail with 15-20 knots (producing strong turbulences at the launcher) and undergo heavy vibrations from the machinery (thus shortening the lifetime of the technical equipment). Routine maintenance is limited to short berthing times in the port.
- Transmission of sounding data to the NMS is only possible through satellite communication. Satellite communication is generally less reliable than land based cable connections.
- On merchant ships, ASAP systems are operated by, members of the ships crews, not by professional observers. Skill and experience depend on the respective operator/crew member.
- Japanese ASAP ships are research vessels of the JMA (Japan Meteorological Agency) and Japan Agency for Marine-Earth Science and Technology (JAMSTEC). Since skilled staff operates the stations there are less problems than in the E-ASAP fleet.

3. E-ASAP fleet

Table 1 shows a list of 16 stations which were in operation in the beginning of 2007. 10 out of 16 stations (ASEU-, ASDE-, and ASGB01) are operationally managed by E-ASAP. The NMS's of France (ASFR-), Denmark (ASDK-), Iceland (ASIS01), and Spain (ASES01) manage the other stations. The naming convention of the stations in the E-ASAP fleet is as follows:

Char	Content
1, 2	AS (fixed data type, i.e., 'Aerology' and 'Ship')
3, 4	ISO alpha-2 country code ('EU' for EUMETNET)
5, 6	Sequential number

This unambiguous naming convention could also be applied to other ASAP stations without the risk of name conflicts. Further, it prevents the unwanted identification of the ships on the internet.

Table 1: Ships in the E-ASAP fleet in Jan 2007

Station	Line service	Sounding equipment
ASEU01	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.
ASEU02	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.
ASEU03	Western Mediterranean –	The 10' container launcher is equipped with a

Station	Line service	Sounding equipment
	Montreal	Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches.
ASEU04	Western Mediterranean – Montreal	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches.
ASEU05	Western Europe – Halifax – Caribbean	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). The master, chief mate and second mate usually carry out launches. The container is installed on a special rack.
ASDE01	Northern Europe – East coast US	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). Almost all crew-members are involved in launching operations.
ASDE02(*)	No dedicated route	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). A skilled observer of Deutscher Wetterdienst DWD carries out launches.
ASDE03	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.
ASDE04	Northern Europe - Caribbean	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The master and the chief mate usually carry out launches. The container is installed on a special rack due to limited space on deck.
ASGB01	Montreal – Northern Europe	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches. There is a deck launcher, which is used when the conditions are unfavourable for container launches.
ASDK01	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASDK02	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASFR1	North West Europe – French West Indies	The ship is equipped with a deck launcher and MODEM SR2K sounding system in the wheelhouse. The electricians usually carry out launches.
ASFR2	North West Europe – French West Indies	The ship is equipped with a deck launcher and MODEM SR2K sounding system in the wheelhouse. The electricians usually carry out launches.
ASIS01	Iceland - East coast US	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). The container is installed on a special rack.
ASES01(**)	Off Mauretania and Canary Islands	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).

(*) The research vessel FS METEOR (ASDE02) does not operate on fixed routes and is not bound to the EUCOS area of interest (70W-40E, 10N-90N).

(**) The hospital ship ESPERANZA DEL MAR (ASES01) follows the Spanish fishing fleet.

The number of stations declined from 16 in January 2007 to 12 in December 2008. Reasons were decisions by the shipping companies to take the ships out of the North Atlantic line service.

In June 2007 the ship SKOGAFOSS (ASAP station ASIS01) was sold and moved to another

service. The Icelandic Met Services did not succeed to find the shipping company Eimskip could provide a replacement ship since no ship.
=> ASIS01 terminated ASAP operations in June 2007.

In July 2008 the charterer of the ship EWL CENTRAL AMERICA II (ASAP station ASEU05) went bankrupt and the North Atlantic line service was terminated without notice while the ship was off the coast of Guatemala. The ship entered a new charter as feeder ship in the Caribbean without any further Atlantic crossings. It was decided to remove the ASAP container and remaining helium cylinders from board in Kingston (Jamaica). The 10ft container unit was shipped to Germany and received in Hamburg in September. After complete refurbishment, the station ASEU05 was installed on the ship ATLANTIC COMPANION. The ship is a sister ship of the ATLANTIC COMPASS (ASAP station ASDE01) on the same line service Northern Europe – East coast US.
=> ASEU05 was successfully transferred to a replacement ship.

In October the ship manager at Maersk US informed that the SeaLand ships SL Performance (ASAP station ASEU01), SL Achiever (ASAP station ASEU02), and SL Motivator (ASAP station ASDE03) have to terminate all ASAP operations. The SL Performance and SL Achiever were serving the North America – Mediterranean route at the time. In November, both 10ft container units were discharged from the ships in Algeciras (Spain) and brought to Hamburg by overland transport. According to the ship manager, the SL Motivator is to be scrapped. Therefore, the 20ft container unit was removed from the ship in Bremerhaven (Germany) and brought to Hamburg in November. No replacement ships could be found so far.
=> ASEU01, ASEU02, and ASDE03 terminated ASAP operations in Oct/Nov 2008.

Figure 4 shows some photographs of the ASEU05 launcher before and after re-installation.

Figure 1: ASEU05 before and after refurbishment (upper left and upper right) and at installation on board the ATLANTIC COMPANION (lower left and lower right).

The E-ASAP fleet is to be extended by three stations in 2009:

- The Danish Met Service procured a GRAW sounding system (Graw Radiosondes GmbH & Co. KG., Germany). This is in line with the goal of E-ASAP to encourage competition on the market. So far, only Vaisala (Vaisala Oyj, Finland) and MODEM (France) are represented as suppliers of radiosondes and sounding systems in the E-ASAP fleet. The third Danish ASAP station ASDK3 commenced launching operations in Feb 2009 and serves the route Denmark – West coast Greenland.
- Meteo France will put two further stations into operation later in 2009. Both stations shall be equipped with MODEM sounding systems and will serve the route North West Europe – French West Indies.

4. Performance of the E-ASAP fleet

The performance of the ASAP stations is included in the national and E-ASAP SOT ASAP reports. Figure 2 shows the distribution of bulletins in 2008 on a 2x2° grid without interpolation.

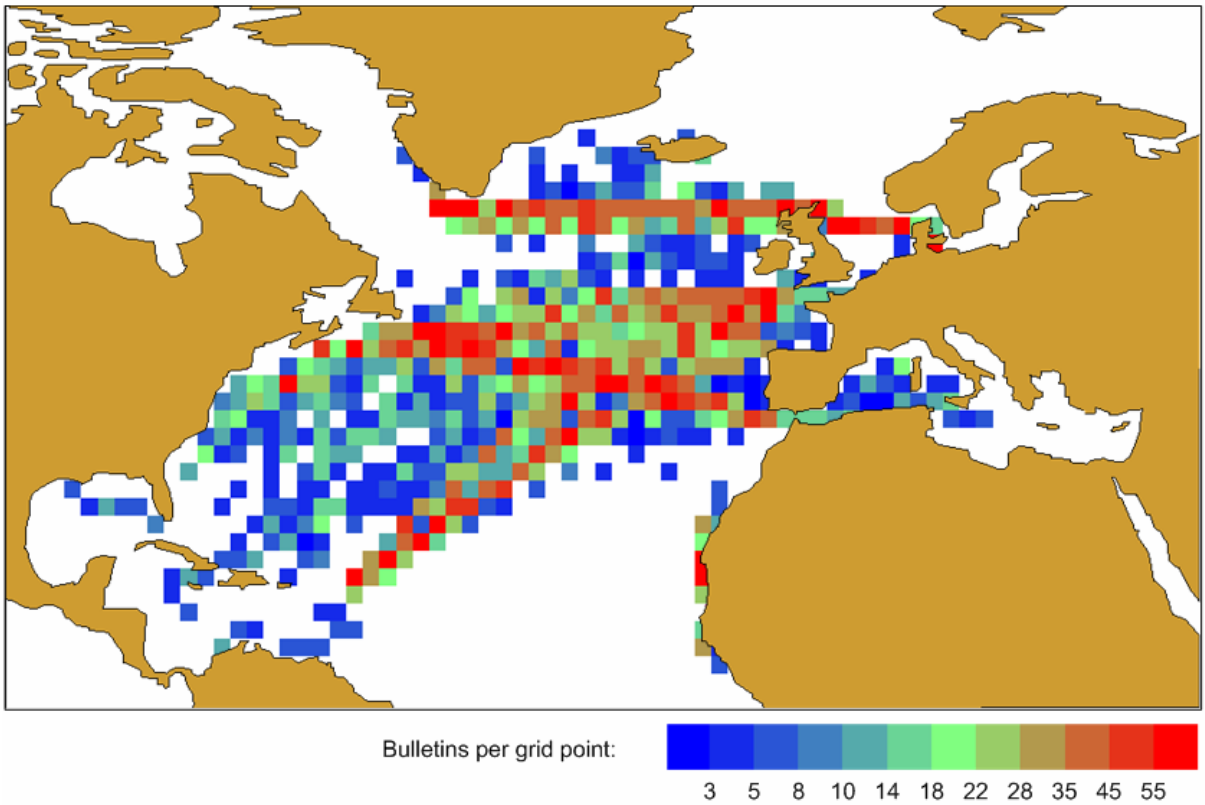

Figure 2: Distribution of TEMP bulletins in 2008 on a 2x2° grid without interpolation.

The distribution demonstrates the main trading lines of the participating container vessels. The individual performances differ widely from month to month and from ship to ship. Mean average over all stations is 19 soundings per month. Total number of soundings on the GTS was 3476 in 2008. Taking into account the total number of launches on board of the ships and received soundings on the GTS, the average GTS/Launches ratio is 84%. This is an improvement to previous years and was mainly achieved through better satellite communication. Nonetheless, several ships showed GTS/Launches ratios of < 75%. Unfortunately, many operators on board the container ships do not sufficiently check the proper automatic transmission of the data after the balloon is successfully launched.

The specific targets for timeliness, availability, and quality were not all achieved. There are many reasons for not achieving the targets. This shall be demonstrated with the example of the

timeliness of the station ASDE04: The total average timeliness HH+100 for the station ASDE04 is 92% against the target of 95%. Figure 3 shows the timeliness from Jan-Dec 2008.

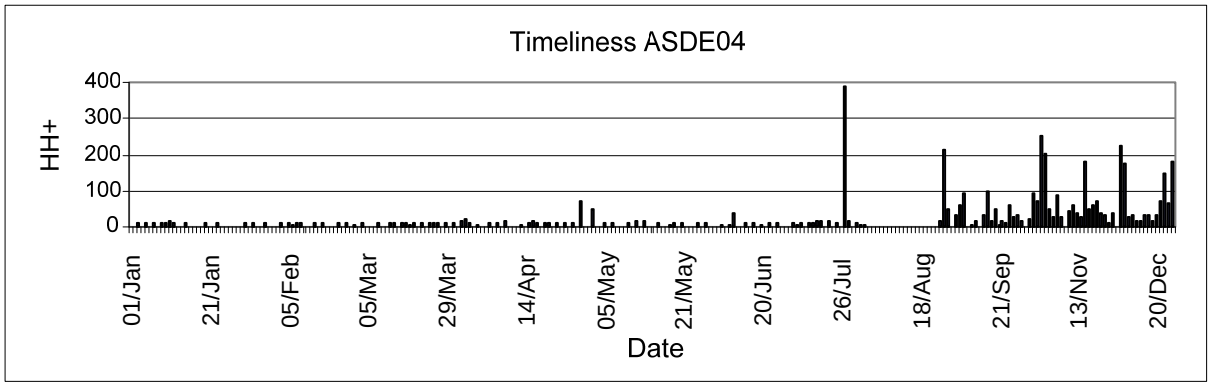

Figure 3: Timeliness of soundings from station ASDE04 in 2008.

In the period from Jan-Aug the timeliness target HH+100 was achieved to 99%. It is obvious that the timeliness decreased since September. The analysis of the problem was hampered by the fact that the ship does not call in ports with E-ASAP maintenance. Several actions were taken to improve the satellite communication. Eventually it turned out that the operators on board had changed and the new operator did not inflate the balloons properly to save helium. Thus, the ascent rate of the balloons was significantly less than 4-5 m/s and the soundings terminated very late.

5. Satellite communication and data format

Improving the satellite communication is one of the challenging technical tasks of E-ASAP. Most ship observations (SYNOP and TEMP) are transmitted via Inmarsat-C. However, transmissions via Inmarsat-C are expensive and limited to short data volumes. A low cost transmission system is required to transmit binary high-resolution BUFR data.

The first Iridium transmission system was installed on the ATLANTIC COMPASS (ASDE01) in July 2008.

Figure 4 shows the timeliness of the station ASDE01 before (96% within HH+100) and after (100% within HH+100) replacement of Inmarsat-C by Iridium.

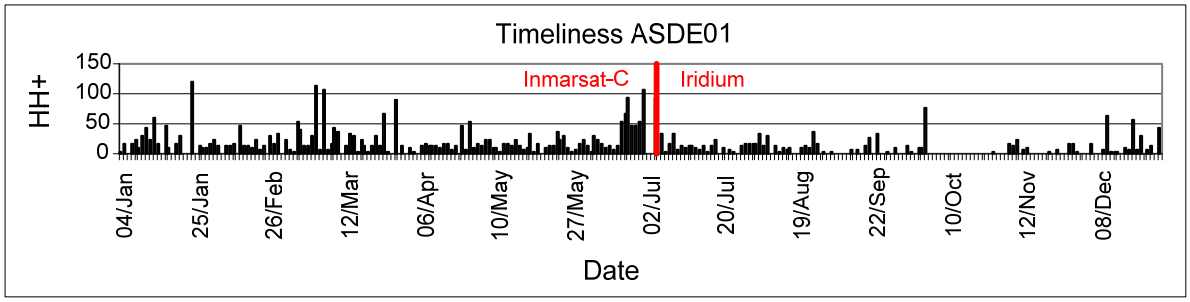

Figure 4: Timeliness of soundings from station ASDE01 in 2008.

The Vaisala DigiCORA software is ready to create high-resolution BUFR data. Thus, the station ASDE01 was configured to create BUFR with levels at 10 sec intervals. The files are transmitted over Iridium. The purpose of the 10 sec interval is to have file sizes of less than 20 Kbyte to keep the transmission time short. Additionally to the four TEMP parts, two BUFR files are transmitted per sounding:

- sounding data from surface to 100 hPa, and
- sounding data from surface to burst height.

6. Japanese ASAP fleet

Table 2 shows a list of the Japanese ASAP ships. The JMA routinely operates ASAP stations on four research vessels in the western north Pacific and seas adjacent to Japan. JAMSTEC operates a station on an oceanographic research vessel in variable areas based on its research purpose. The average ratio of GTS/Launches is more than 98%.

Ship name	Area	Sounding equipment
Ryofu Maru/JMA	North Pacific	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Kofu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Seifu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Chofu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Mirai/JMA	Variable areas	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.

7. Risks

Unexpected termination of ASAP operations due to changes in the ship services etc. is a permanent risk. In 2008, this happened four times. Main impact of the current economic crisis is the shortening of charter contracts between shipping companies and the flexibility of line services. This implicates that many ship managers are reluctant to agree on their participation, if the ASAP activities are limited to long-term line services in certain regions like the North Atlantic.

Furthermore, many new ships have very limited free deck space to host an ASAP container launcher, even if it is a 10ft container. Open deck launchers provide better flexibility to be installed on board. In this case, less space on deck is required and the electronic equipment is installed inside the ship (e.g. wheelhouse). Figure 5 shows the open deck launcher, which is, installed on board the French ASAP ships.

Figure 5: Open deck launcher

A further risk is the shortage of helium on the world market. There are no options to store sufficient reserves at E-ASAP premises or in the ports of call. If helium cannot be delivered to the ship in time, then the ship will sail without re-supplies.

8. Conclusion

The conditions to involve merchant vessels in ASAP operations have significantly deteriorated due to the global financial crisis, which came up in 2008. The shipping industry reacts with shorter charter contracts and reduced line services. The limited space on board can partly be overcome by choosing open deck launchers instead of container launchers. However, long time services are essential for regional programmes like E-ASAP. Installation and de-installation require financial and managerial efforts, which are not worth for line services of less than six month.

An impact study of Met Norway in 2007 showed a significant positive impact from the E-ASAP network on the NWP results in Europe. A worldwide ASAP programme would have more options to find participating ships since the sailing routes are not bound to specific regions. However, this requires clear agreements on the financing (taking into account the uneven spatial distribution of soundings and possible changes in the sailing routes) and management (in case that technical maintenance has to be transferred to other countries due to changed sailing routes).